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REPORT ON STATUS OF THE EUROPEAN CORN BORER in 1936

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The relative abundance of the European corn borer in the fall of 1936 and its status this year, in comparison with 1935, were determined from a survey conducted from August 10 to October 2 by the Bureau of Entomology and Plant Quarantine over a large part of the territory infested by the insect. The activity was directed from the laboratory for European corn borer research at Toledo, Ohio, W. A. Baker in charge. Nineteen men, operating singly, were engaged in the field work. The survey involved approximately 39,100 miles of travel and the examination of 2,148 cornfields, taken at random on a county or county-group basis, within a total of 156 counties in Michigan, Indiana, Ohio, Pennsylvania, New York, Vermont, Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New Jersey, Delaware, Maryland, and Virginia.

Active cooperation in the survey was given by the Conservation Department of Indiana and the State Department of Agriculture in Maine, the former surveying three county groups (120 fields) in Indiana, and the latter surveying seven counties (140 fields) in Maine.

Thoroughly tested field methods, known to supply data adequate for comparisons between counties and county groups for 1 or more years, were employed. Generally, the counties situated in the older infested portion of the area were considered separately, and in each a total of 20 random fields were surveyed.

In the more lightly infested sections, the counties were combined in groups of from two to five, and in each group a total of 30 or 40 random fields were surveyed. The percentage of plant infestation was determined by a count of 100 plants in each field, and the average number of borers per infested plant was found by a dissection of 10 infested plants in each field of a county unit and of 5 infested plants in each field of a county group.

The accompanying tables, maps, and chart show the status of the European corn borer in 1936, in comparison with its abundance in recent years, and the following discussion summarizes the situation in 1936.

LAKE STATES (MICHIGAN, INDIANA, OHIO, PENNSYLVANIA, AND WESTERN NEW YORK)

Definite decreases in infestation in 1936, as compared with 1935, occurred in eastern Indiana, where the average number of borers per 100 plants decreased from 9.3 in 1935 to 3.2 in 1936; in the lower two-thirds of the region surveyed in the western half of Ohio, where the average number of borers per 100 plants diminished from 22.5 in 1935 to 3.5 in 1936; and in the "thumb" section of Michigan, where the average number of borers per 100 plants decreased from 142.7 in 1935 to 55.3 in 1936. As a result of such decreases in population, the status of the corn borer in the above portions of the infested territory in 1936 was little changed from that prevalent in the drought year of 1934, with a practical elimination of the gain in 1935. These decreases in numbers of the borer in 1936 are attributed to drought, particularly to the effect of a lack of rainfall in the first half of July, supplemented by abnormally high temperatures prevalent during the second week of that period.

Borer populations in the northwestern corner of Ohio and the southeastern part of Michigan, west of Lake Erie, however, were at least as high in 1936 as in 1935, with significant increases appearing in 11 of the 23 counties surveyed and with tendencies to increase evident in 5 of the remaining counties. In general, there was a more favorable moisture distribution in these sections than in the areas that showed decreased infestation. This permitted multiplication of the borer despite an appreciable reduction of live forms early in the season, owing to a pupal mortality of approximately 20 percent caused by excessive heat the second week of July. Nevertheless, the high temperatures detrimental to the pupae were probably responsible for the production of a limited second generation of the corn borer in this area, the progeny from which augmented, in some cases, the fall population figures. However, both in the surveyed part of Ohio, as a whole, and in southeastern Michigan, including the regions of decrease in both States previously mentioned, there was a significant increase in the average number of borers per 100 plants in 1936 over 1935. In Ohio, this average increase was from 36.8 borers per 100 plants in 1935 to 50.6 in 1936, and in Michigan, from 45.7 borers per 100 plants in 1935 to 57.8 in 1936.

Corn borer infestation in the Lake States in 1936 was most intense west and south of the western end of Lake Erie, and the highest populations, observed as in 1935, were in Lucas and Wood Counties, Ohio, with averages of 161.5 and 138.4 borers per 100 plants, respectively. Eighteen (or 45 percent) of the 40 fields surveyed in the two counties had populations ranging from 115 to 727 borers per 100 plants.

The borer was found to be present in negligible numbers in central Indiana and in the southwestern corner of Michigan, over a region not surveyed in the past 3 years. It is probable that the drought prevalent in 1936 also operated in this territory to reduce infestation.

In parts of central Michigan not previously surveyed, the borer was found to be practically as abundant as in some of the older infested counties of the eastern section of the State. An average infestation of 68.5 borers

per 100 plants occurred in the Clinton-Gratiot-Saginaw-Shiawassee County group and an average of 13.6 borers per 100 plants in the Barry-Eaton-Ionia County group. Ten (or 25 percent) of the 40 fields surveyed in the former county group had populations of over 100 borers per 100 plants, including one field that averaged 558 borers per 100 plants.

Corn borer abundance in 1936 remained at the relatively low level of 1935 in counties bordering the Lakes in western New York, where the weather was very dry in the first half of July 1936, and in Centre County, Pa. Only 1 field of 110 surveyed in western New York and 2 fields of 60 surveyed in central Pennsylvania in 1936 had populations of more than 100 borers per 100 plants.

EASTERN STATES (VERMONT, MAINE, NEW HAMPSHIRE, MASSACHUSETTS, CONNECTICUT, RHODE ISLAND, NEW YORK (SUFFOLK COUNTY), NEW JERSEY, DELAWARE, MARYLAND, AND VIRGINIA)

Significant increases in corn borer abundance appeared in 1936 in southwestern Vermont, central Massachusetts, eastern Connecticut, Rhode Island west of Narragansett Bay, and Monmouth County, N.J. Numbers of the insect increased appreciably in the Connecticut River Valley of central Massachusetts, as shown in the survey of the Franklin-Hampden-Hampshire-Worcester County group (in Massachusetts), in which the average population rose from 20.5 borers per 100 plants in 1935 to 218.9 in 1936. Nineteen of the 40 fields surveyed in this county group showed populations of over 100 borers per 100 plants, and averaged 437.5 borers per 100 plants. In Monmouth County, N. J., where the average number of borers per 100 plants increased from 43.4 in 1935 to 93.7 in 1936, 4 of the 20 fields surveyed had populations of over 100 borers per 100 plants, including a maximum of 553 borers per 100 plants in 1 field. The increases observed in the Eastern States were as follows: In the area including Addison-Bennington-Rutland Counties, Vt., from an average of 27.4 to 59.6 borers per 100 plants; in New London-Tolland-Windham Counties, Conn., from an average of 38.9 to 104.4 borers per 100 plants; and in Kent-Providence-Washington Counties, R. I., from an average of 71.5 to 154.2 borers per 100 plants.

With the exceptions of Essex and Bristol Counties, Mass., where populations of the borer remained practically unchanged, there was a lower infestation during the current than in the previous season, along the Atlantic coast from York County, Maine, to and including Bristol-Newport Counties, R. I. In Middlesex County, Conn., in Suffolk County, on Long Island, and on the Eastern Shore of Maryland and Virginia definite decreases also occurred in the abundance of the insect from 1935 to 1936. The causes for all of these reductions are not known, but it appears certain that, in the surveyed portions of Maryland and Virginia, abnormally dry weather in May and early in June, at the time of first-generation oviposition and larval establishment, was responsible for low survival of the borer.

Borer populations, in 1936, in northwestern Vermont, in Hartford and New Haven Counties, Conn., and in the Atlantic-Burlington-Ocean County group in New Jersey remained practically unchanged.

The greatest abundance of the pest, either in the Lake or Eastern States, continued to be in southern New England and on Long Island, N. Y. Some of the highest borer populations in 1936 occurred in New Haven and Hartford Counties, Conn., where in 14 (or 35 percent) of the 40 fields surveyed, the average number of borers per 100 plants exceeded 500, and in 7 (or 17.5 percent) of the fields there were over 1,000 borers per 100 plants. In the latter class the field populations ranged from 1,041 to 1,880 borers per 100 plants. Only a light infestation appeared in Rockingham-Strafford Counties in the southeastern corner of New Hampshire, and in the eight counties surveyed in Maine.

In 1936 the counties of Middlesex, N. J., and Sussex, Del., were surveyed for the first time. An average of 6.7 borers per 100 plants was determined for the former county, with half of the 20 surveyed fields showing infestation, and an average of 1.1 borers per 100 plants was found in the latter county, with the distribution confined to 3 of the 30 fields surveyed, which had populations of 30, 3, and 1, borers per 100 plants, respectively.

Table 1.--Abundance of the European corn borer in the fall of 1936 as compared with 1934 and 1935

County or county group	Average borers per 100 plants		
	1934	1935	1936
Lake States			
Michigan	Number	Number	Number
Lenawee	13.3	5[illegible].4	53.6
Macomb	20.9	45.9	[illegible]3.2
Monroe	27.6	42.9	98.0
St. Clair	11.8	57.3	69.4
Washtenaw	2.7	1[illegible].5	45.4
Wayne	7.7	7.2	98.6
Genesee-Huron-Sanilac-Tuscola	15.[illegible]	1[illegible]2.7	55.[illegible]
Hillsdale-Ingham-Jackson	1.2	1[illegible].1	26.[illegible]
Lapeer-Livingston-Oakland	3.7	23.5	29.9
Allegan-Kent-Ottawa	-	-	0.2
Barry-Eaton-Ionia	-	-	13.[illegible]
Branch-Calhoun-Kalamazoo-St.Joseph	-	-	1.0
Berrien-Cass-VanBuren	-	-	0
Clinton-Gratiot-Saginaw-Shiawassee	-	-	[illegible]8.5
Regional average(based on first 9 counties and county groups)	11.[illegible]	45.7	57.8

Table 1. (continued)

County or county group	Average borers per 100 plants		
	1934	1935	1936
Ohio	Number	Number	Number
Defiance	8.1	4.8	11.0
Fulton	30.1	41.0	63.9
Hancock	25.9	33.3	96.5
Henry	10.4	24.7	74.2
Lucas	32.7	121.5	161.5
Ottawa	22.5	25.9	86.9
Paulding	3.0	42.1	10.6
Putnam	3.1	37.1	52.1
Sandusky	5.8	48.4	107.1
Seneca	16.7	27.9	31.8
Williams	2.5	9.2	15.4
Wood	47.3	91.2	138.4
Allen-Auglaize-Mercer-Van Wert	5.4	29.2	5.3
Champaign-Darke-Logan-Miami-Shelby	5.0	12.9	0.5
Clark-Fayette-Greene-Madison-Montgomery	0.3	0.5	0.1
Crawford-Wyandot	1.5	13.7	2.8
Delaware-Hardin-Marion-Union	7.1	7.3	1.5
Regional average	12.9	36.8	50.6
Indiana			
Adams-Blackford-Jay-Wells	0.3	2.3	0.1
Allen-De Kalb-Steuben	7.7	27.8	10.9
Delaware-Henry-Randolph-Wayne	0	1.2	0
Huntington-Noble-Whitley	2.1	5.9	1.6
Elkhart-Lagrange-St. Joseph	-	-	0
Fayette-Rush-Shelby-Union	-	-	0
Fulton-Kosciusko-Marshall	-	-	0
Grant-Howard-Miami-Wabash	-	-	0.3
Hamilton-Madison-Tipton	-	-	0
Regional average(based on first 4 county groups)	2.7	9.3	3.2
New York			
Chautauqua-Erie-Niagara	13.9	14.4	9.5
Jefferson-Oswego	41.4	44.8	34.7
Monroe-Orleans-Wayne	65.1	17.4	10.2
Regional average	40.1	25.5	18.1

Table 1. (continued)

County or county group	Average borers per 100 plants		
	1934	1935	1936
Pennsylvania	Number	Number	Number
Centre	-	22.5	20.0
Juniata-Mifflin-Snyder-Union	-	-	0
Eastern States			
Vermont			
Addison-Bennington-Rutland	-	27.4	62.6
Chittenden-Grand Isle-Washington	-	37.2	66.7
Regional average	-	32.3	64.7
Maine			
Oxford	-	2.5	0
York	-	10.4	0
Androscoggin	-	-	0
Cumberland	-	-	0
Franklin	-	-	0
Kennebec	-	-	0
Lincoln	-	-	3.0
Sagadahoc	-	-	0.8
Regional average, based on first two counties	-	6.5	0
Massachusetts			
Bristol	107.2	86.1	56.7
Essex	105.8	200.5	180.2
Middlesex	185.9	303.9	156.8
Barnstable-Norfolk-Plymouth	153.5	259.8	50.1
Franklin-Hampden-Hampshire-Worcester	40.1	20.5	216.9
Regional average	118.5	174.2	131.9
Rhode Island			
Bristol-Newport	172.3	150.1	63.1
Kent-Providence-Washington	63.7	71.5	154.2
Regional average	117.0	110.8	108.7

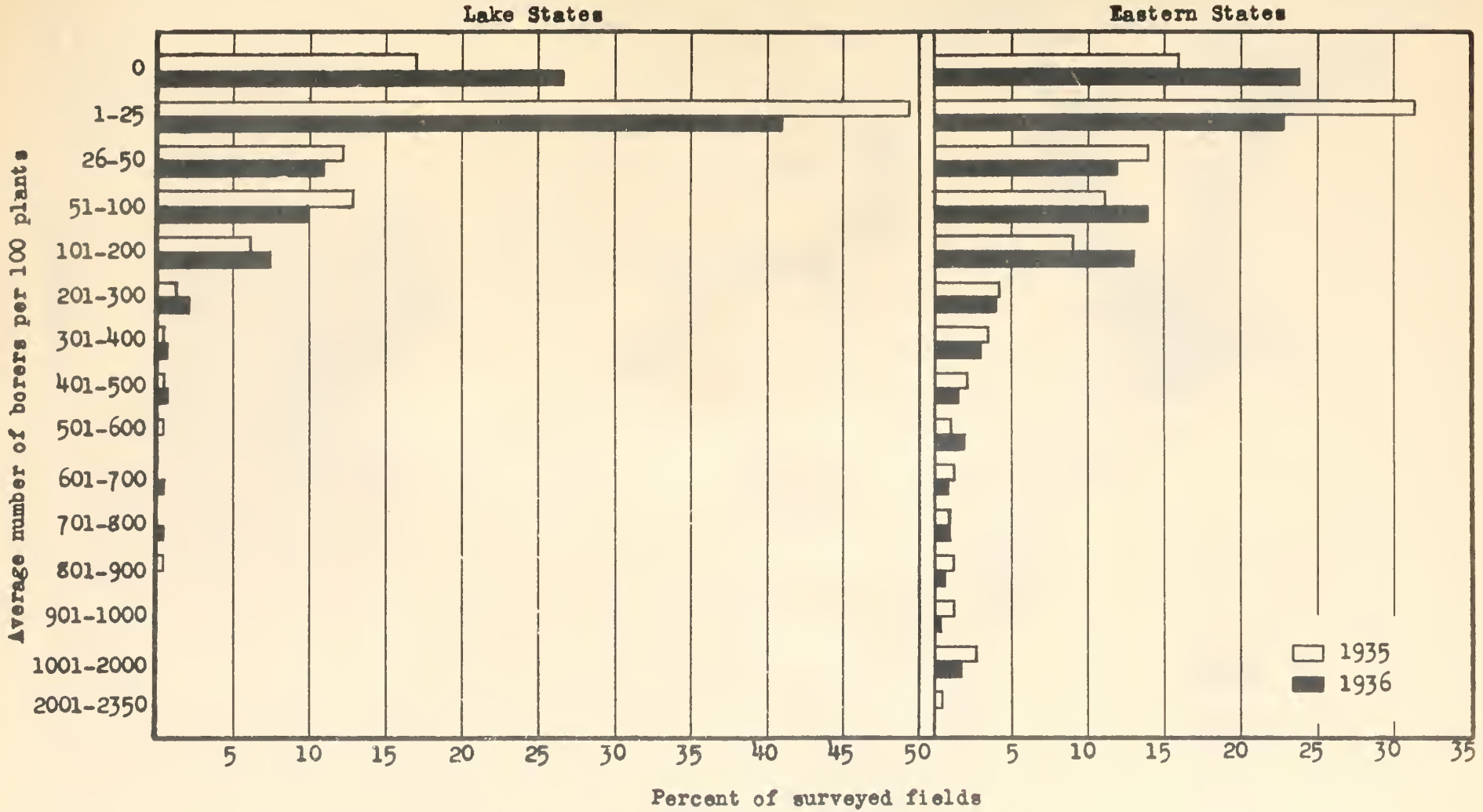
Table 1. (continued)

County or county group	Average borers per 100 plants		
	1934	1935	1936
Connecticut	Number	Number	Number
Hartford	61.3	721.4	538.9
Middlesex	318.2	415.3	119.0
New Haven	325.0	469.2	391.7
New London-Tolland-Windham	-	38.9	104.4
Regional average (based on 1st 3 counties)	234.8	535.5	349.9
New Hampshire			
Rockingham-Strafford	8.7	72.6	10.4
New York (Long Island)			
Suffolk	279.6	595.0	306.9
New Jersey			
Monmouth	20.4	43.4	93.7
Atlantic-Burlington-Ocean	3.4	33.3	19.4
Middlesex	-	-	6.7
Regional average (based on first county and county group)	11.9	38.4	56.6
Maryland			
Wicomico-Worcester	-	9.4	0
Virginia			
Accomac-Northampton	-	18.1	5.1
Delaware			
Sussex	-	-	1.1

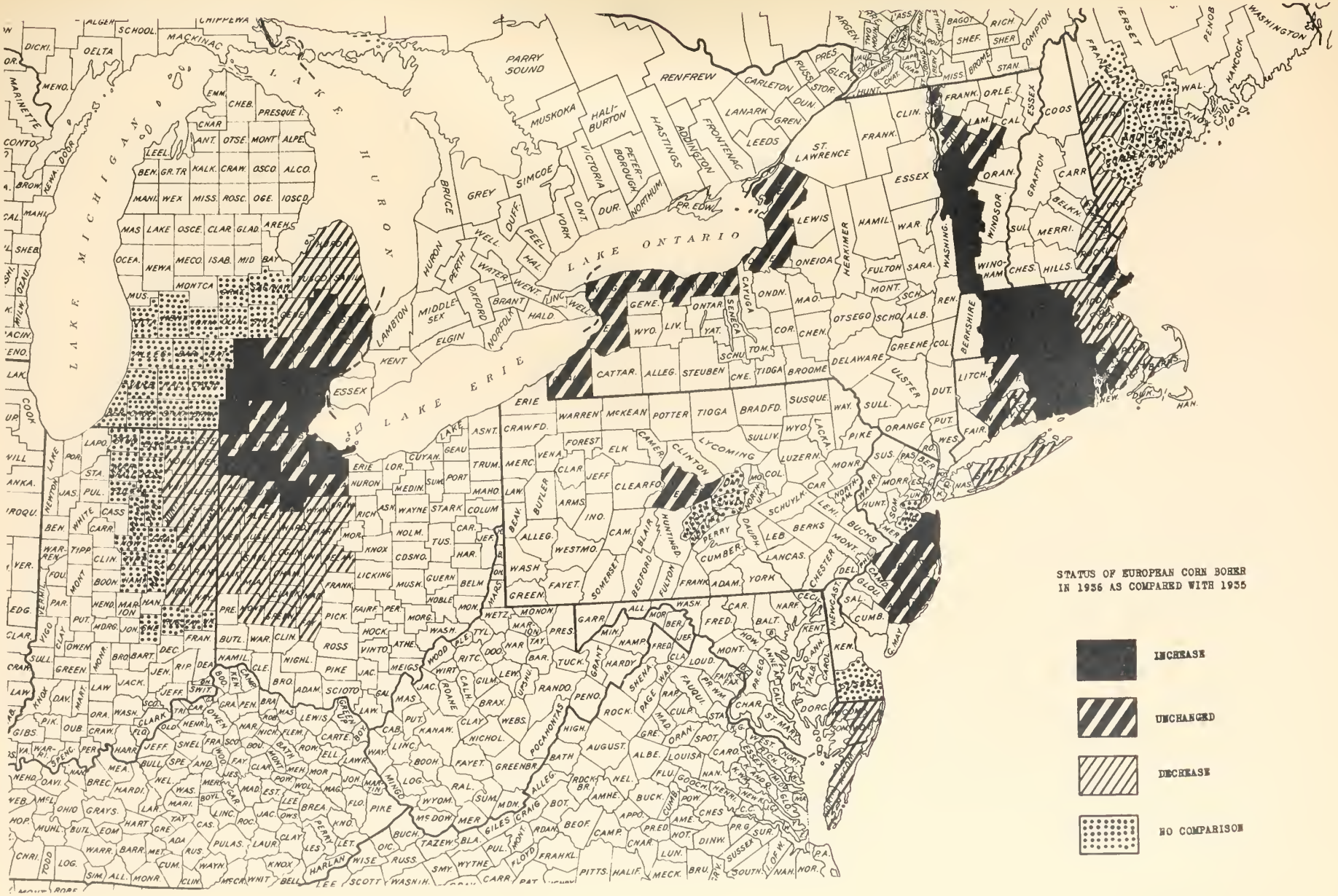
Table 2.--Summary of European corn borer abundance by States and areas, 1934-1936

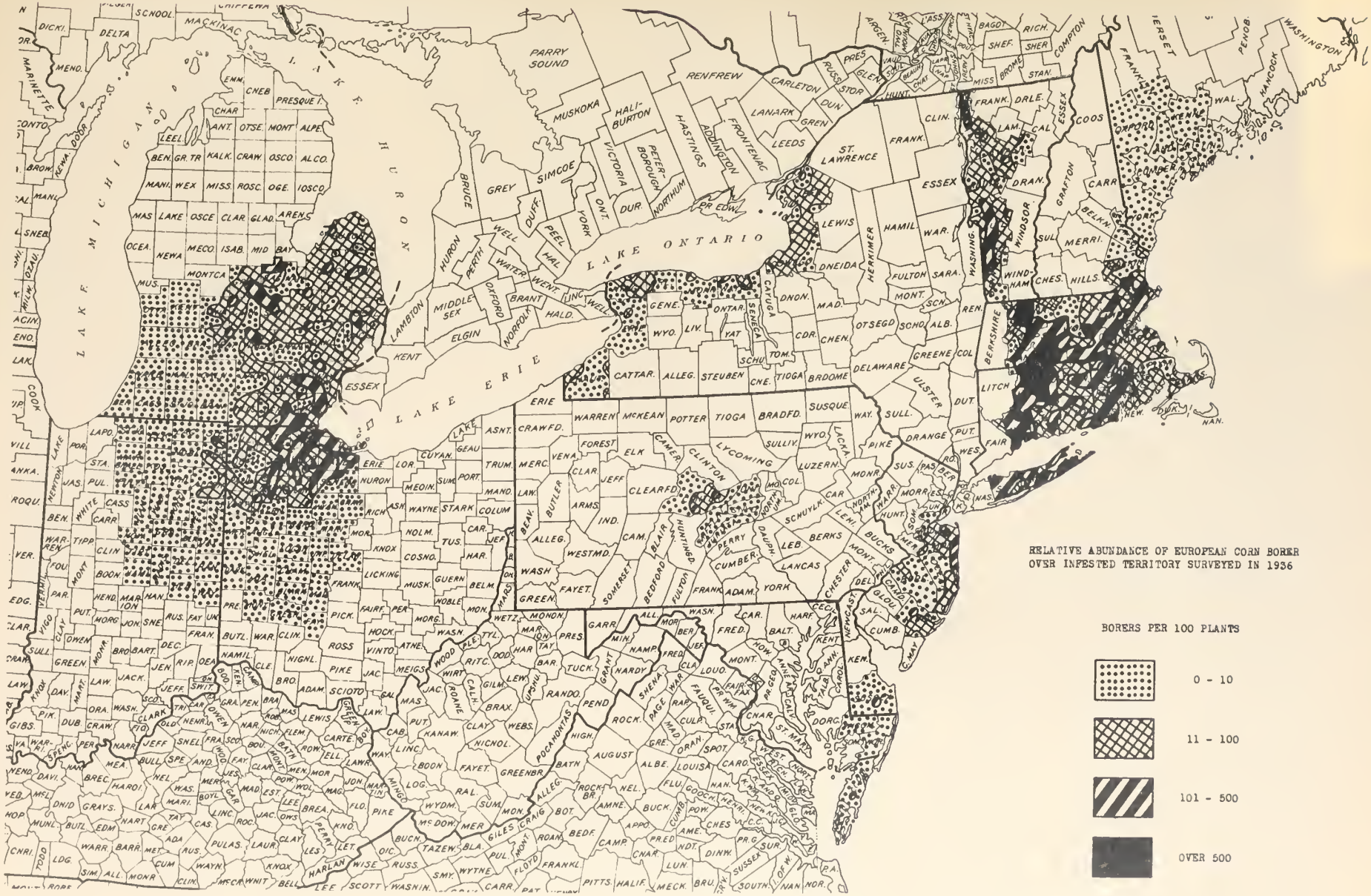
Area or State	Counties or county groups	Average borers per 100 plants*		
		1934	1935	1936
Lake States	Number	Number	Number	Number
Michigan	9	11.6	45.7	57.8
Ohio	17	12.9	36.8	50.[illegible]
Indiana	4	2.7	9.3	3.2
New York	3	40.1	25.5	18.1
Pennsylvania	1	-	22.5	20.0
Areal average (based on 33 counties in first 4 States)	-	13.8	34.9	43.8
Eastern States				
Massachusetts	5	118.5	174.2	131.9
Rhode Island	2	117.[illegible]	110.8	108.7
Connecticut	3	2[illegible].[illegible]	535.5	349.9
New Hampshire	1	[illegible].7	72.[illegible]	10.4
New Jersey	2	[illegible].[illegible]	38.4	56.[illegible]
New York (Suffolk Co.)	1	27[illegible].[illegible]	595.0	706.9
Vermont	2	-	32.3	64.7
Maine	2	-	[illegible].5	0
Delaware	1	-	-	1.1
Maryland	1	-	9.4	0
Virginia	1	-	18.1	5.1
Areal average (based on 14 counties in first 6 States)	--	131.7	245.9	188.4

* All averages based only on comparable counties or county groups.



Grouping of cornfields surveyed in 1935 and 1936, in comparable counties, according to their borer populations. The percentages for the Lake States are based on 830 fields, and those for the Eastern States, on 550 fields, surveyed in each of the two years.


STATUS OF EUROPEAN CORN BORER
IN 1936 AS COMPARED WITH 1935
INCREASE
UNCHANGED
DECREASE
NO COMPARISON
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE


RELATIVE ABUNDANCE OF EUROPEAN CORN BORER
OVER INFESTED TERRITORY SURVEYED IN 1936
BORERS PER 100 PLANTS
0 - 10
11 - 100
101 - 500
OVER 500
LAKE MICHIGAN
LAKE HURON
LAKE ONTARIO
LAKE ERIE